State Implementation of Federal Air Quality Initiatives

Clean Air Interstate Rule
Clean Air Mercury Rule

November 21, 2005

Pollutant Transport

- Ambient air pollution is…
- Local emissions + transported emissions
  - Manmade sources
  - Natural sources
- Certain pollutants are more “transportable”
  - Ozone & fine particulate matter ($PM_{2.5}$)
  - Certain forms of mercury
- EPA has determined that emissions from Iowa sources significantly contribute to non-attainment in IL, IN and WI

Pollutant Transport

Image Source: NASA

Primer

- Pollutant Precursors
  - NO_X: Nitrogen Oxides
    - Formed during high temperature combustion
    - Precursor to ozone and fine particulate matter ($PM_{2.5}$)
  - SO_2: Sulfur Dioxide
    - Formed during the combustion of sulfur containing materials or fuels
    - Precursor to fine particulate matter ($PM_{2.5}$)

Health Affects

- **Fine Particulate Matter ($PM_{2.5}$)**
  - Linked to aggravated asthma, increases in respiratory symptoms like coughing and difficult or painful breathing, chronic bronchitis, decreased lung function, premature death
- **Ozone (O3)**
  - Causes respiratory irritation, reduced lung function, inflammation and damage to the lining of the lungs.
- **Mercury (Hg)**
  - Neurotoxic affects from consumption of bioaccumulated methyl mercury

CAIR & CAMR

- **Clean Air Interstate Rule**
  - Requires implementation of emission control programs for nitrogen oxides (NO_X) and sulfur dioxide (SO_2)
  - NO_X and SO_2 are precursors of ozone and fine particulate matter
- **Clean Air Mercury Rule**
  - Requires implementation of an emission control programs for mercury from coal fired electric generating units
  - Methyl-mercury exposure via fish consumption

Non-Attainment Areas

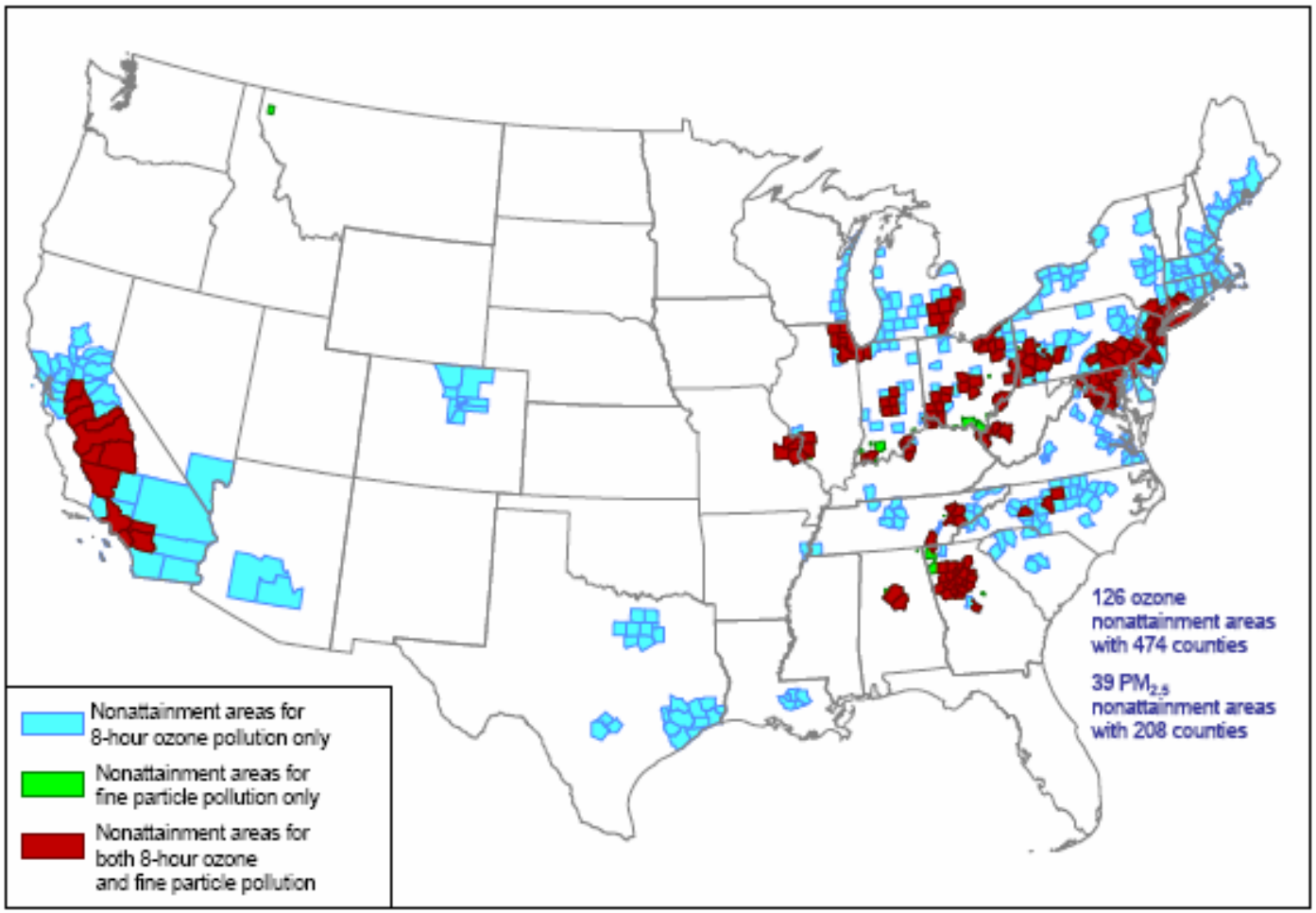
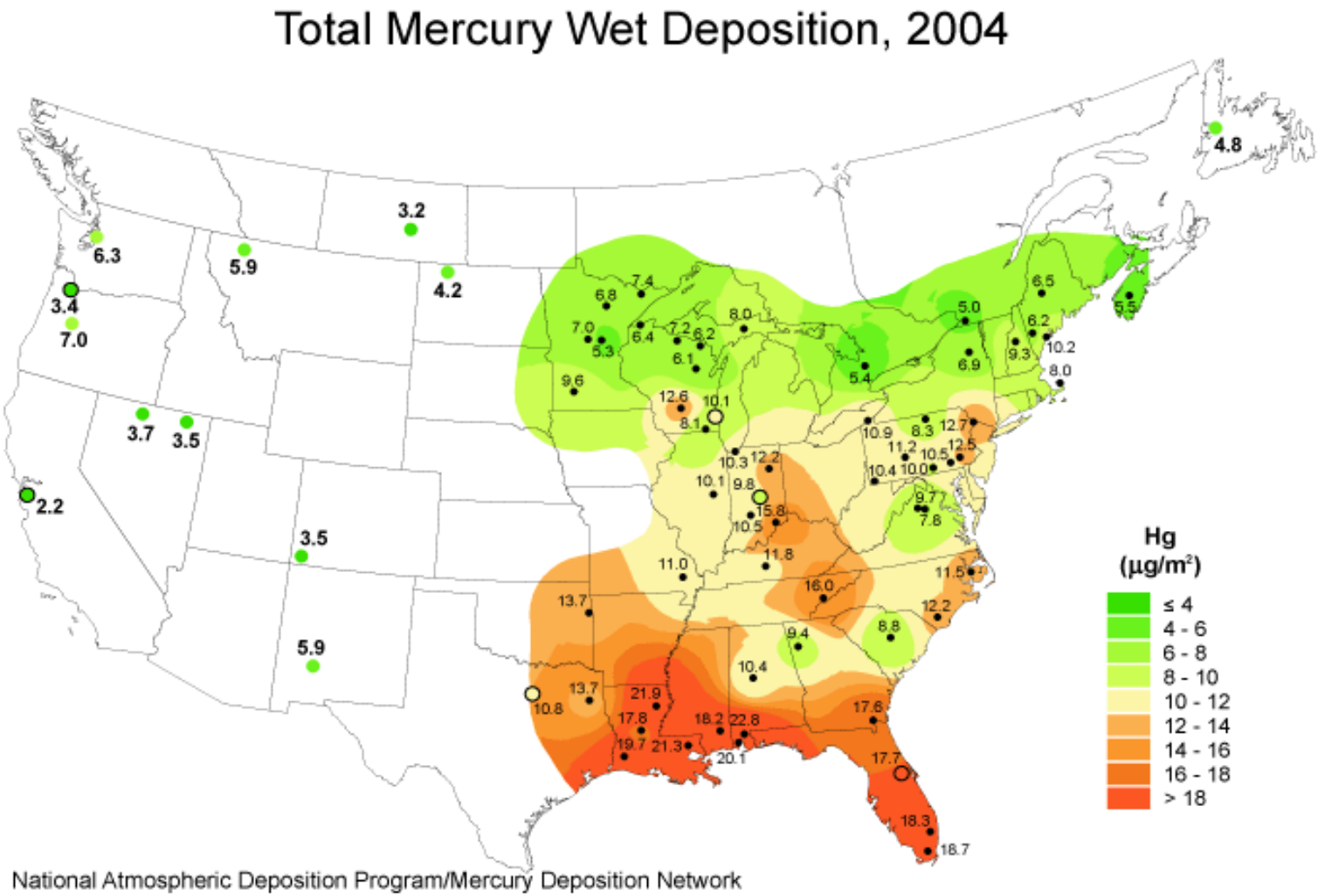


Image Source: U.S. EPA

Air quality in shaded areas does not meet federal health standards

Mercury Deposition



CAIR & CAMR Overview

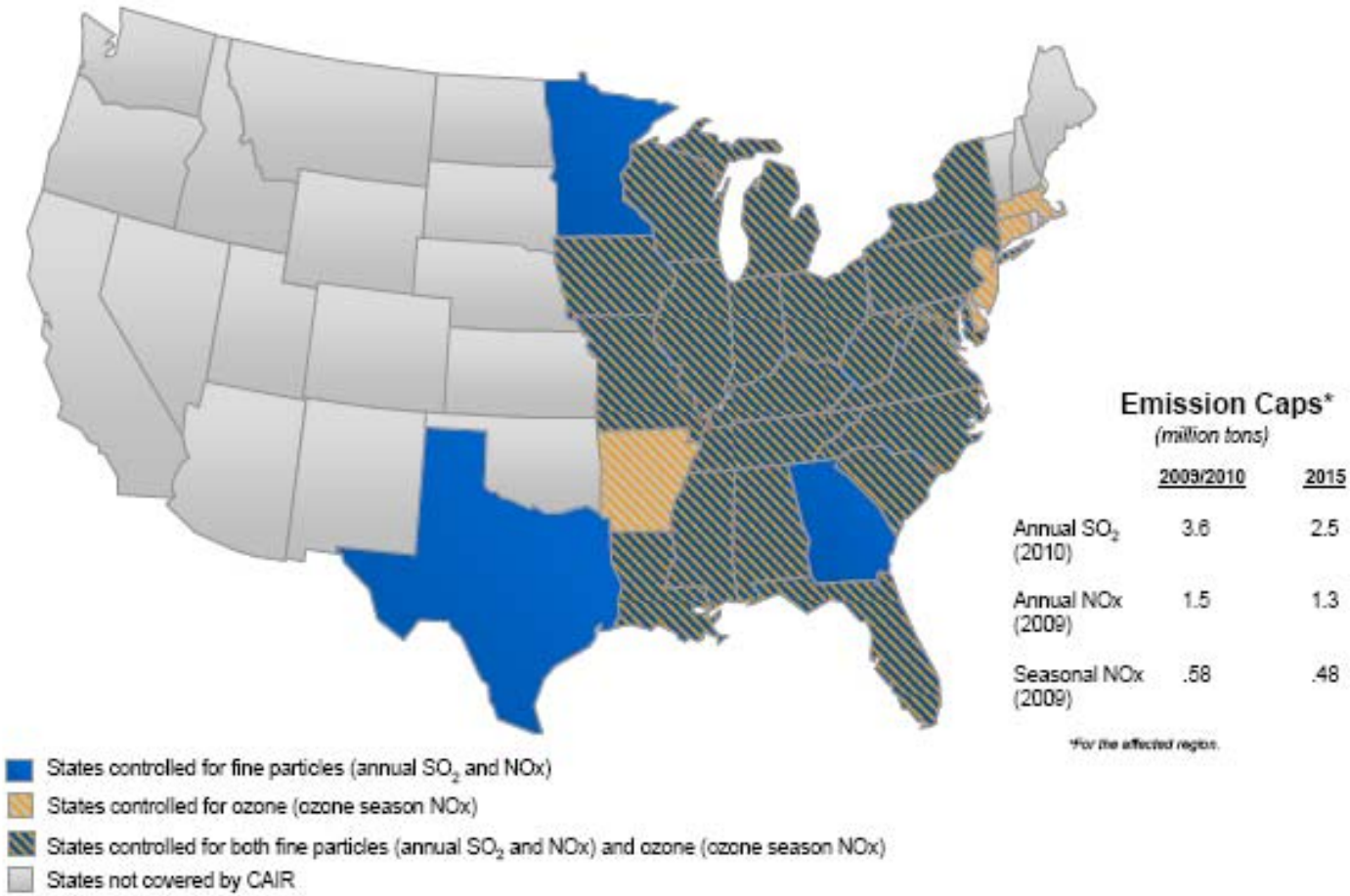
- General Features
  - States **must** meet future year emission targets
  - Include model rules for cap and trade programs
  - Electric generating units (EGUs)
  - Designed to address cumulative impacts resulting from pollutant transport

The Clean Air Interstate Rule is a federal initiative which requires most states in the eastern U.S. to reduce emissions of NO_X and SO_2 that impact downwind ozone and fine particulate matter non-attainment areas

CAIR

- Clean Air Interstate Rule
  - Two basic implementation options:
    - Implement the EPA suggested cap and trade program for electric generating units, or
    - Mandate controls and cap one or more industry sector in Iowa

CAIR Region



Emission Caps*
(million tons)

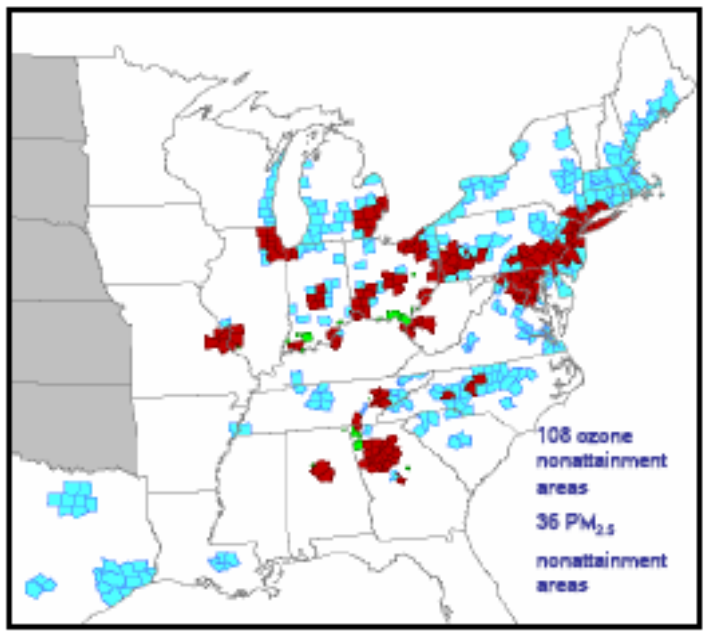
	2009/2010	2015
Annual SO_2 (2010)	3.6	2.5
Annual NOx (2009)	1.5	1.3
Seasonal NOx (2009)	.58	.48

*For the affected region.

Image Source: U.S. EPA

CAIR – Projected Results

Ozone and Fine Particle Nonattainment Areas (April 2005)



Projected Nonattainment Areas in 2015 after Reductions from CAIR and Existing Clean Air Act Programs

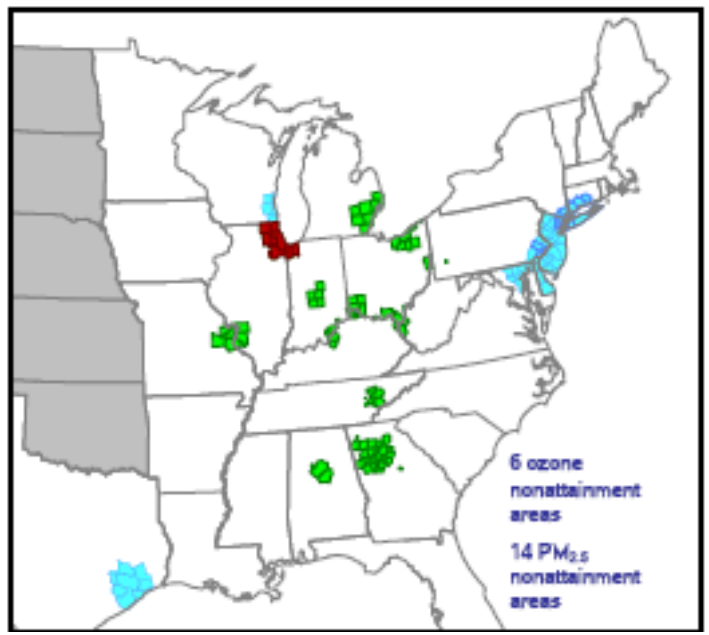


Image Source: U.S. EPA

8-hr Ozone Non-attainment

PM2.5 Non-attainment

8-hr Ozone and PM2.5 Non-attainment

CAIR – Iowa Emissions Data

Actual emissions and CAIR state cap levels

	Actual Emissions (2002)	**Emission Cap (2009/10)**	**Emission Cap (2015)**
Nitrogen Oxides (Tons)	**80,758** (100%)	**32,692** ~60% less than 2002	**27,243** ~65% less than 2002
Sulfur Oxides (Tons)	**132,399** (100%)	**64,095** ~50% less than 2002	**44,866** ~65% less than 2002

The Clean Air Mercury Rule is a federal initiative which requires states nationwide to reduce the emissions of mercury from coal fired power plants

Global Mercury Inputs

(Man Made Direct Emissions – Tons per Year)

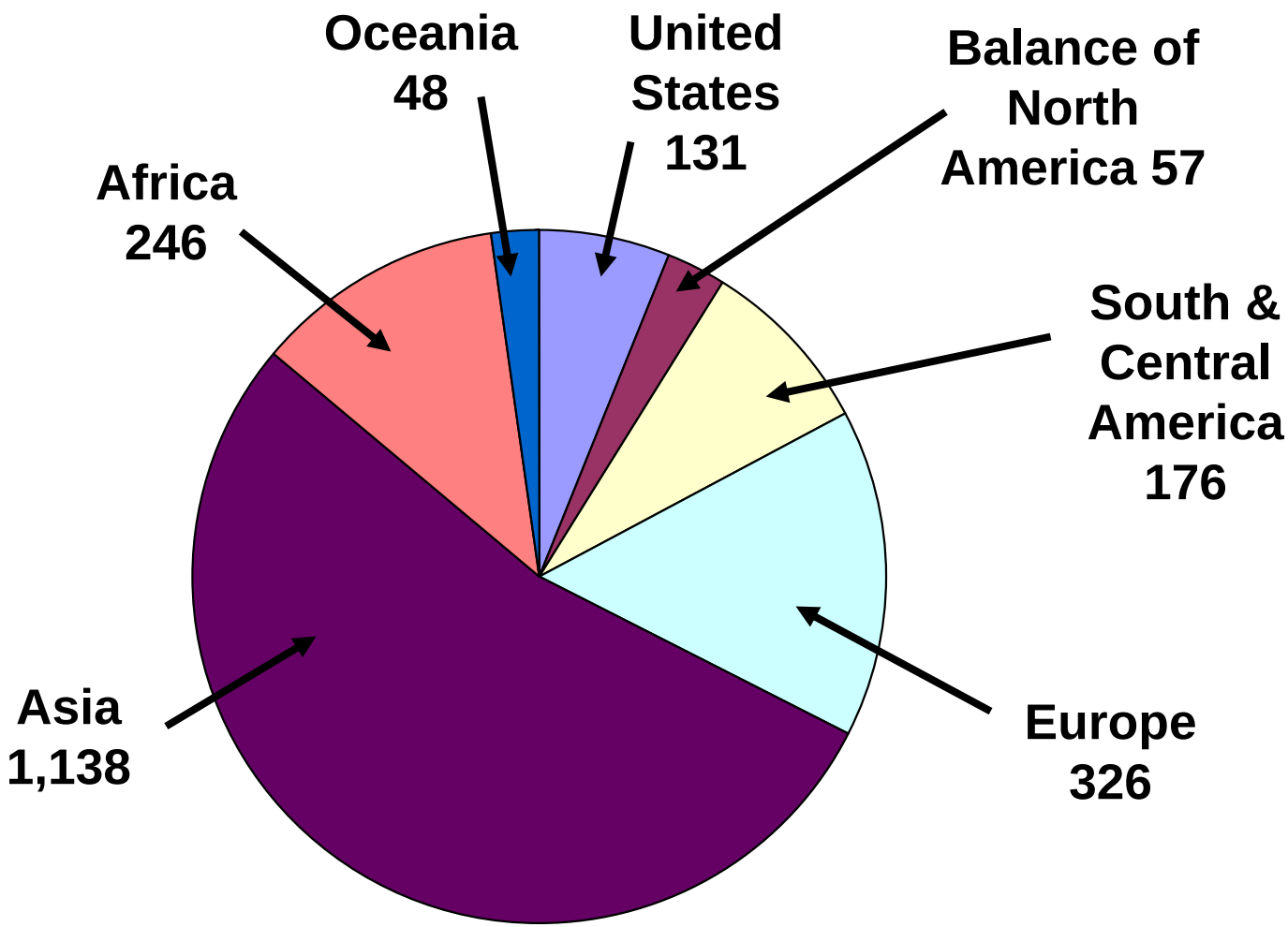
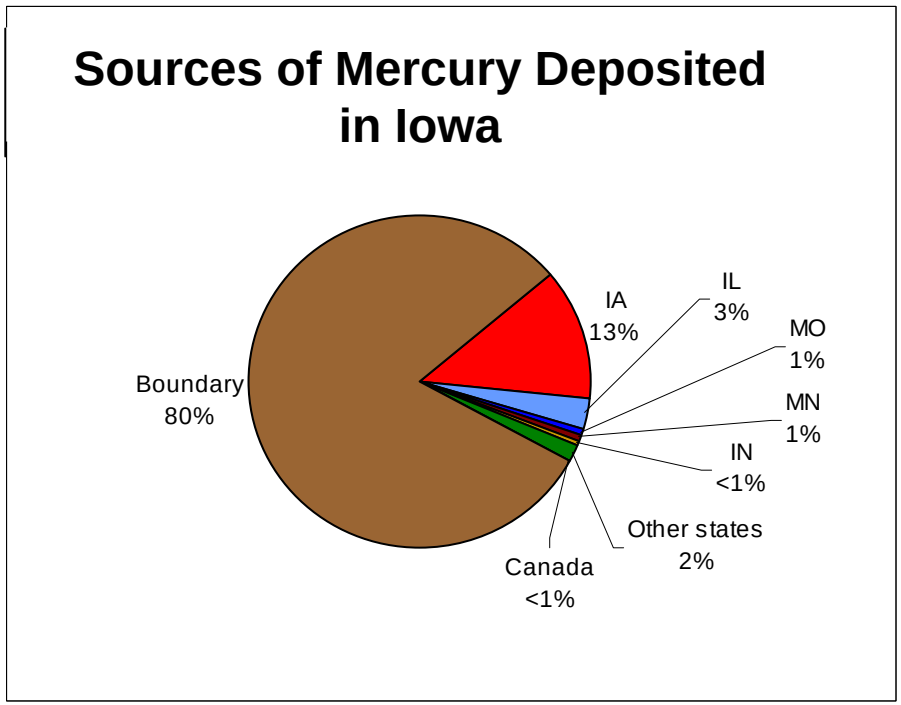


Chart from U.S. EPA Mercury Presentation, adapted from EPRI, 2004

Mercury Deposition Estimates

Preliminary Computer Simulation Results

REMSAD Mercury Deposition - 1998



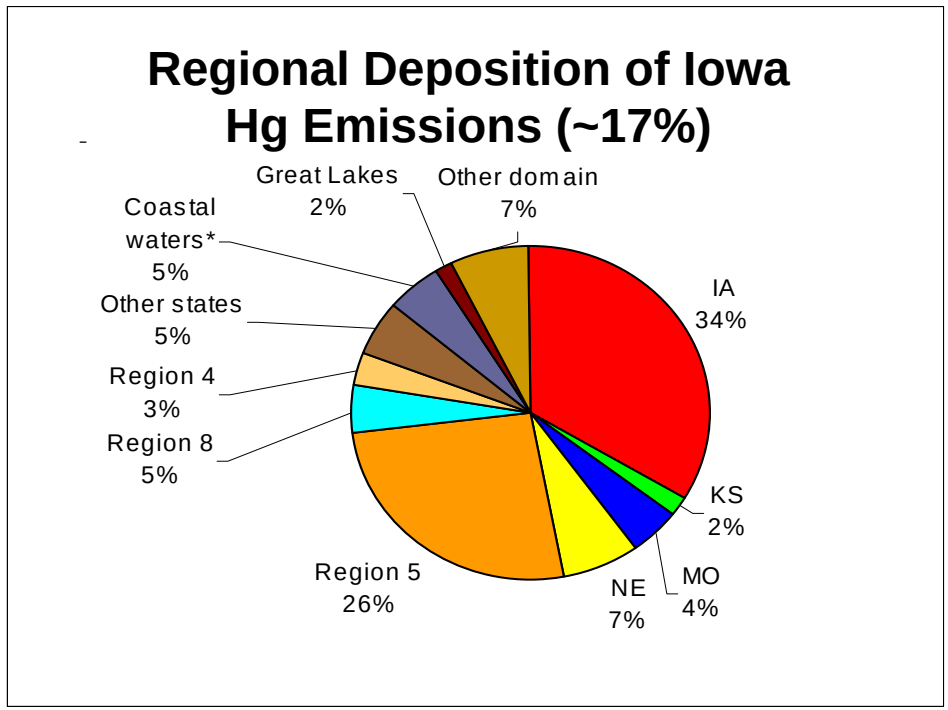
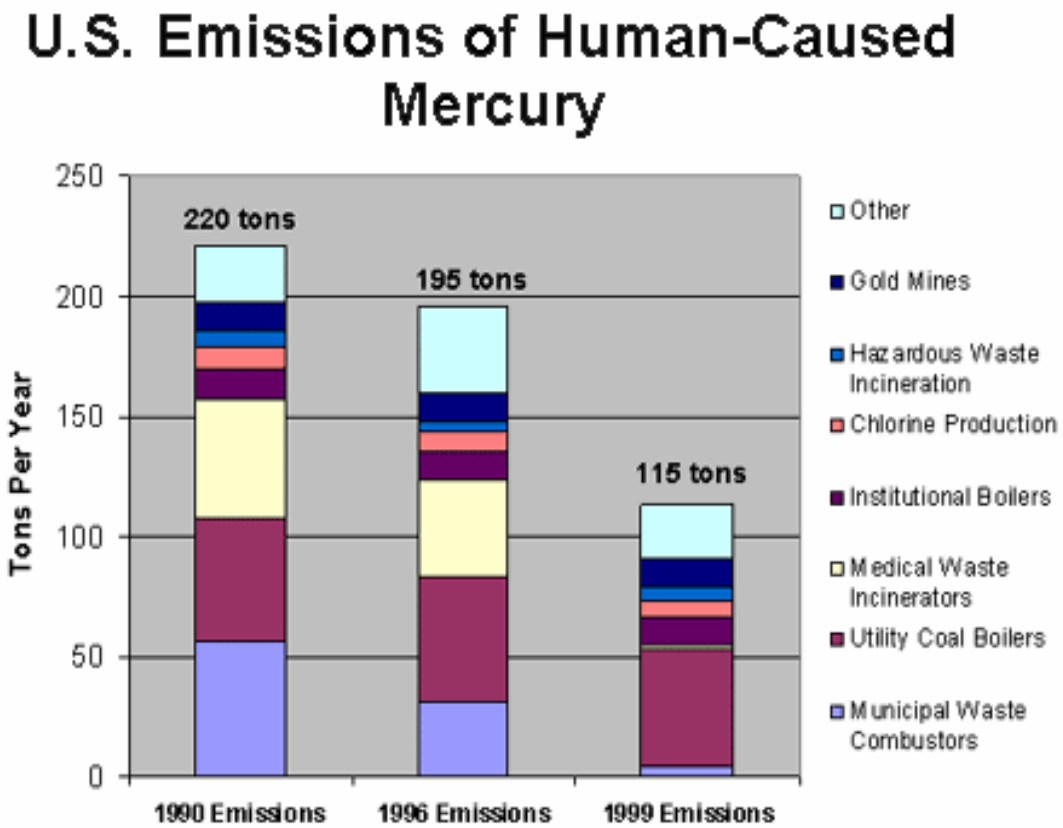


Image and Data Source: U.S. EPA Presentation on Mercury

U.S. Mercury Control History

- Mercury use limits in batteries and paints
- Control requirements for waste combustors
- Chlorine production facilities
- Industrial boilers
- Coal fired EGU’s via Clean Air Mercury Rule

U.S. Mercury Control History



- Mercury emissions have decreased by almost 50% since 1990
- Coal fired EGUs are largest remaining single source sector of mercury emissions in the U.S.
- CAMR will reduce mercury emissions nationwide by 29% at full implementation
- This represents an emission reduction of ~70% from the electric power sector

CAMR

- Clean Air Mercury Rule
  - States have two basic options:
    - Implement the EPA suggested cap and trade program for electric generating units, or
    - Mandate source by source controls in such a way as to stay under state level cap

CAMR - Iowa Emissions Data

Actual mercury emissions and CAMR state cap levels in ounces

	Actual Emissions (2002)	**Emission Cap (2010)**	**Emission Cap (2018)**
EGU Hg (oz.)	**30,728** (100%)	**23,264** ~25% less than 2002	**9,184** ~70% less than 2002

Ongoing CAMR Debate

- General agreement that less mercury in the environment is a good… Disagreement on the “details”
  - Primary issues
    - Magnitude of emissions reduction
    - Timing of control implementation
    - Legal basis – using CAA Section 111 vs. 112
    - Emissions trading or command and control
    - Source by source requirements versus a “forever” cap
  - Litigation being supported by some environmental groups and states
  - State & Local Air Directors Association (STAPPA) model rule package
  - Uncertainty concerning the impact of any version of mercury control for EGUs will have on reducing mercury exposure from fish consumption

EPA recommends implementation of the CAIR and CAMR rules through participation in their emissions cap and trade programs

Emissions Trading

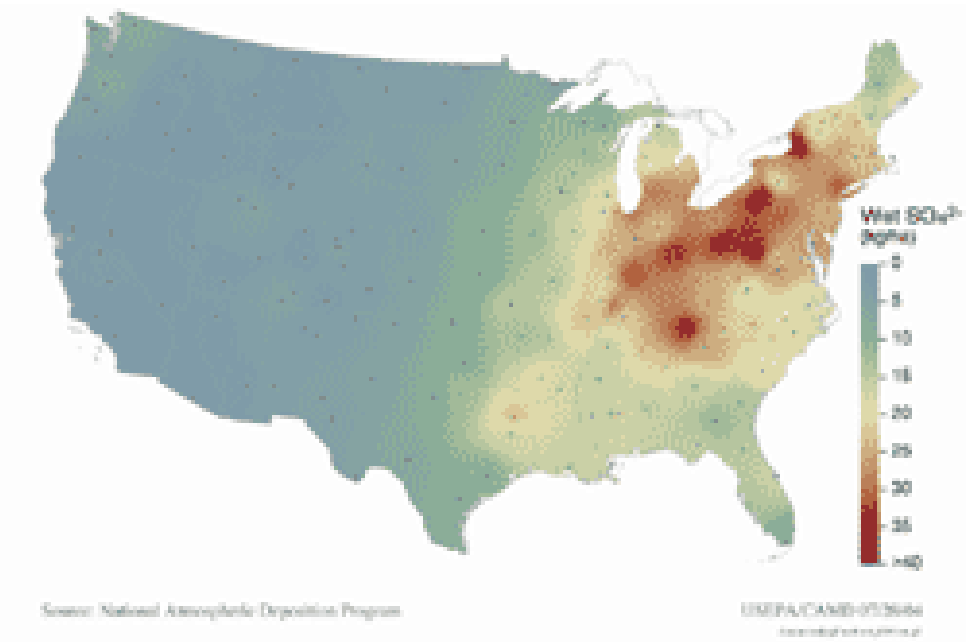
- Each unit of emission requires that one allowance be used (e.g., 1 ton of SO_2 or 1 oz. or Hg)
- Participants must conduct extensive emissions monitoring
- Emission allowances are traded on open markets
- Regulators retain ability to address local ambient air quality concerns
- Regulatees determine the most appropriate approach to compliance for their company

Emissions Trading

- Not a new or novel concept…
  - Clean Air Act Acid Rain Program
  - Northeast Ozone Transport Commission
  - California RECLAIM program
  - Texas state trading programs
  - EPA “NOX SIP Call” for 1-hour ozone
  - Proposed regional haze related trading programs

Emissions Trading Results
Acid Rain Program Example

Annual Mean Wet Sulfate Deposition
1989 through 1991



Annual Mean Wet Sulfate Deposition
2001 through 2003

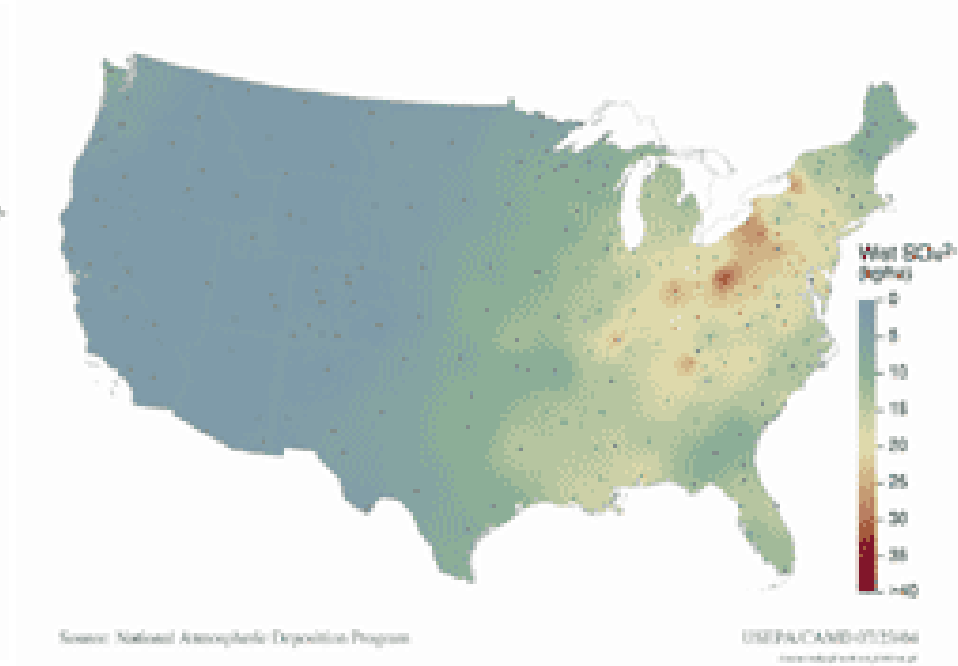


Figure 3: Wet sulfate deposition decreased throughout the early 1990s in much of the Ohio River Valley and Northeastern U.S. Other less dramatic reductions were observed across much of New England, portions of the Southern Appalachian Mountains and in the Midwest. Average decreases in wet deposition of sulfate range from 39 percent in the Northeast to 17 percent in the Southeast. Click images to view larger maps.

Source: http://www.epa.gov/acidrainreport/

Emissions Trading

- How it works…
  - Problem is cumulative so solution can also be cummulative
  - Cap and trade mandates that emission reduction goals are met
  - One allowance must be held per unit of emission
  - Each unit of emission costs 1 emission allowance
  - Market forces establish trade currency (allowance) value
  - Compliance methods are left to the regulated entities
  - Managed by EPA
    - Penalties are automatic, equal, and punitive

Emissions Trading

- Supply and demand
  - Each unit of emission demands one allowance be used
  - Decreasing cap reduces the “supply” of allowances available
  - Value of emission allowances increase as supply tightens
  - Most cost effective emission controls are installed first
  - Companies determine their compliance approach
  - For more information on emissions trading see:
    - http://www.epa.gov/airmarkets/

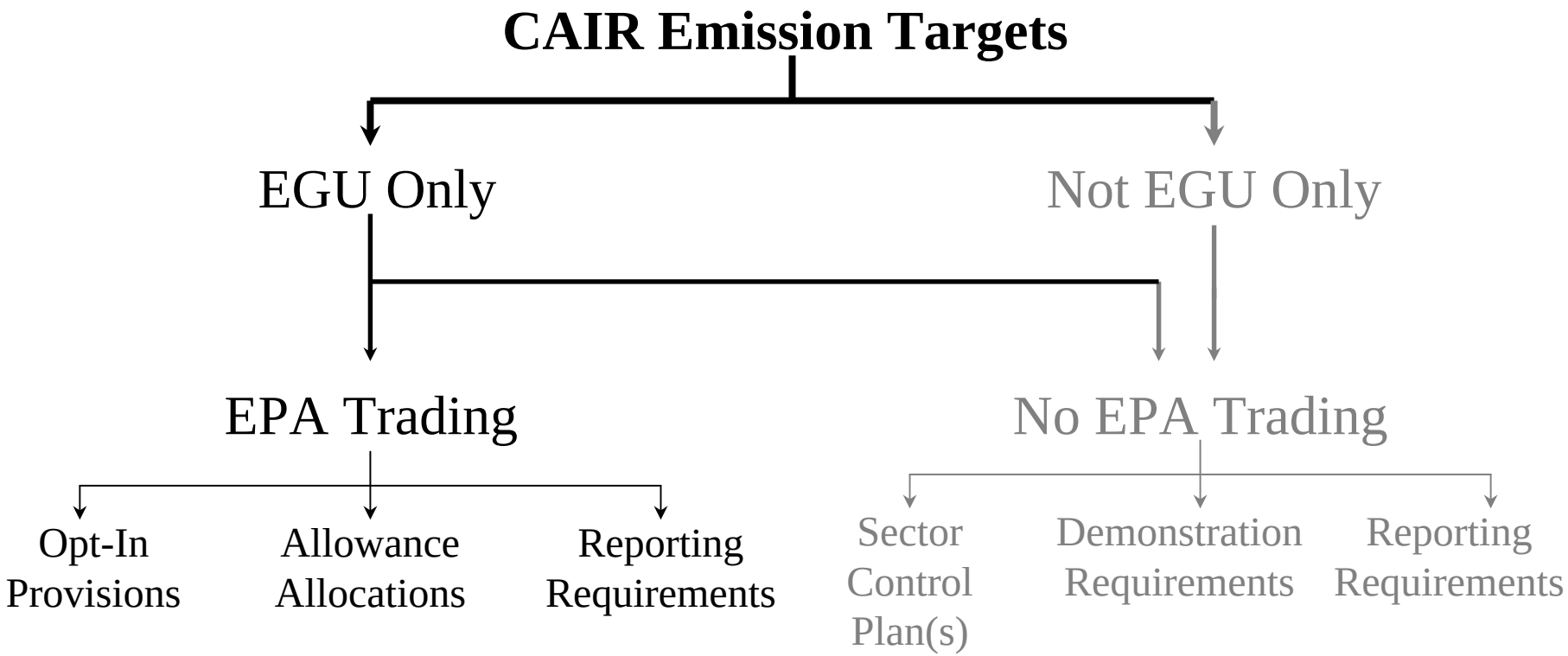
The department solicited implementation recommendations from a group of stakeholders during the summer of 2005

Stakeholder Workgroup

- Goal:
  - Solicit implementation recommendations from a wide variety of Iowa stakeholders
- Invitees:
  - DNR Air Quality, DNR Energy, Iowa Utilities Board, Consumer Advocates Office, Iowa Department of Economic Development, U.S. EPA Region VII
  - Investor owned, municipal and rural electric cooperative utility companies, Iowa Association of Municipal Utilities, Iowa Utility Association, University Power Plants
  - Sierra Club, Iowa Environmental Council, Iowa Association of Business and Industry
- Active May through August 2005
- Presentations and final recommendations available at:
  - http://www.iowadnr.com/air/prof/caircamr/index.html

Workgroup Process

- Department led the workgroup through discussions concerning rule details and options, collected recommendations at various decision points



State Proposal

- Department recommendations
  - Adopt both CAIR and CAMR via EPA managed cap and trade programs
    - Meets federal requirements
      - Regional / national emissions reductions
        - » NOX: 2.0 million tons reduction (61% below 2003 levels)
        - » SO2: 5.4 million tons reduction (73% below 2003 levels)
        - » Hg: 33 ton reduction (~70%)
    - Complies with state stringency provisions
    - Least resource intensive for department
    - Least disruptive to Iowa businesses
    - Follows recommendation of stakeholder workgroup
      - Note: Sierra Club objected to use of emissions trading programs, particularly for CAMR

Questions?

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